



## Complete Summary

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### TITLE

Iatrogenic pneumothorax in non-neonates: rate per 1,000 eligible admissions.

### SOURCE(S)

AHRQ quality indicators. Pediatric quality indicators: technical specifications [version 3.2]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Feb 29. various p.

McDonald K, Romano P, Davies S, Haberland C, Geppert J, Ku A, Choudhry K. Measures of pediatric health care quality based on hospital administrative data: the pediatric quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Sep. 130 p. [82 references]

## Measure Domain

### PRIMARY MEASURE DOMAIN

Outcome

The validity of measures depends on how they are built. By examining the key building blocks of a measure, you can assess its validity for your purpose. For more information, visit the [Measure Validity](#) page.

### SECONDARY MEASURE DOMAIN

Does not apply to this measure

## Brief Abstract

### DESCRIPTION

This measure is used to assess the number of patients with an iatrogenic pneumothorax per 1,000 eligible admissions.

### RATIONALE

This indicator is intended to flag cases of pneumothorax caused by medical care, which is sustained following a procedure or due to barotrauma. Good technique when performing vascular access or thorocentesis may reduce the risk of this complication. For patients on ventilators, monitoring of pressures may also reduce the risk of this complication.

## PRIMARY CLINICAL COMPONENT

Iatrogenic pneumothorax

## DENOMINATOR DESCRIPTION

All surgical and medical discharges under age 18 defined by specific Diagnosis Related Groups (DRGs)

Exclude cases:

- neonates with birth weight less than 2500 grams
- with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 512.1 in the principal diagnosis field
- with an ICD-9-CM diagnosis code of chest trauma or pleural effusion
- with an ICD-9-CM procedure code of thoracic surgery, lung or pleural biopsy or diaphragmatic surgery repair or assigned to a cardiac surgery DRG
- normal newborn (DRG 391)
- Major Diagnostic Category (MDC) 14 (pregnancy, childbirth, and puerperium)

**Note:** Refer to the original measure documentation for specific DRG and ICD-9-CM codes.

## NUMERATOR DESCRIPTION

Discharges among cases meeting the inclusion and exclusion rules for the denominator with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 512.1 in any secondary diagnosis field

### Evidence Supporting the Measure

## EVIDENCE SUPPORTING THE CRITERION OF QUALITY

- A formal consensus procedure involving experts in relevant clinical, methodological, and organizational sciences
- One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

### Evidence Supporting Need for the Measure

## NEED FOR THE MEASURE

Variation in quality for the performance measured

## EVIDENCE SUPPORTING NEED FOR THE MEASURE

Agency for Healthcare Research and Quality (AHRQ). National healthcare quality report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2003.

Miller MR, Zhan C. Pediatric patient safety in hospitals: a national picture in 2000. Pediatrics2004 Jun;113(6):1741-6. [32 references] [PubMed](#)

Sedman A, Harris JM 2nd, Schulz K, Schwalenstocker E, Remus D, Scanlon M, Bahl V. Relevance of the Agency for Healthcare Research and Quality Patient Safety Indicators for children's hospitals. Pediatrics2005 Jan;115(1):135-45. [17 references] [PubMed](#)

## State of Use of the Measure

### STATE OF USE

Current routine use

### CURRENT USE

Internal quality improvement  
Quality of care research

## Application of Measure in its Current Use

### CARE SETTING

Hospitals

### PROFESSIONALS RESPONSIBLE FOR HEALTH CARE

Physicians

### LOWEST LEVEL OF HEALTH CARE DELIVERY ADDRESSED

Single Health Care Delivery Organizations

### TARGET POPULATION AGE

Age less than 18 years

### TARGET POPULATION GENDER

Either male or female

### STRATIFICATION BY VULNERABLE POPULATIONS

Unspecified

## Characteristics of the Primary Clinical Component

### INCIDENCE/PREVALENCE

Using 1997 Healthcare Cost and Utilization Project (HCUP) data, the National Healthcare Quality Report cited rates of iatrogenic pneumothoraces in the pediatric population (less than 19 years). These analyses showed that this patient safety event occurred frequently and at rates comparable to those in adults (e.g., 0.48 per 1,000 discharges at 0 to 17 years, 0.42 at 18 to 44 years, 0.43 at 45 to 64 years, and 0.74 at 65 or more years). Other groups have analyzed rates of this indicator using the publicly available indicator definition applied to a pediatric population; this definition differs slightly from the definition proposed for this measure. In 2000, Miller et al. found iatrogenic pneumothoraces occurred at a rate of 0.3 per 1,000 discharges among 0 to 18 year old children. Also, iatrogenic pneumothorax was found to result in, on average, 11.6 days increased length of stay, \$61,991 increased charges, and 7.5 times higher odds of in-hospital mortality (after adjusting for age, gender, expected payer, up to 30 comorbidities, and multiple hospital characteristics, including ownership, teaching status, nursing expertise, urban location, bed size, pediatric volume, coding intensity, intensive care unit (ICU) bed percentage, and surgical discharge percentage). An analysis of National Association of Children's Hospitals and Related Institutions (NACHRI) data from 1999 to 2002 showed a range of rates (risk adjusted) from 0.74 per 1,000 discharges in 2002 to 0.82 per 1,000 discharges in 1999 (i.e., a slight downward trend over time).

## **EVIDENCE FOR INCIDENCE/PREVALENCE**

Agency for Healthcare Research and Quality (AHRQ). National healthcare quality report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2003.

Miller MR, Zhan C. Pediatric patient safety in hospitals: a national picture in 2000. *Pediatrics* 2004 Jun;113(6):1741-6. [32 references] [PubMed](#)

Sedman A, Harris JM 2nd, Schulz K, Schwalenstocker E, Remus D, Scanlon M, Bahl V. Relevance of the Agency for Healthcare Research and Quality Patient Safety Indicators for children's hospitals. *Pediatrics* 2005 Jan;115(1):135-45. [17 references] [PubMed](#)

## **ASSOCIATION WITH VULNERABLE POPULATIONS**

In children, procedures like central line placement, thoracentesis, or Swan-Ganz catheter placement can be technically more complex than in older patients due to their smaller anatomy (though they are more likely to be performed in a monitored setting). Also, in comparison to adults, iatrogenic pneumothoraces in neonates are primarily due to barotrauma, with the very smallest infants being at greatest risk (as shown by our preliminary empirical analyses). In an older pediatric population, while barotraumas can occur, the risks for iatrogenic pneumothoraces are more clinically similar to an adult population (e.g., at risk while receiving a central line, catheter, or undergoing thoracentesis procedures).

See the "Incidence/Prevalence" field.

## **EVIDENCE FOR ASSOCIATION WITH VULNERABLE POPULATIONS**

McDonald K, Romano P, Davies S, Haberland C, Geppert J, Ku A, Choudhry K. Measures of pediatric health care quality based on hospital administrative data: the pediatric quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Sep. 130 p. [82 references]

## **BURDEN OF ILLNESS**

See the "Incidence/Prevalence" field.

## **UTILIZATION**

See the "Incidence/Prevalence" field.

## **COSTS**

See the "Incidence/Prevalence" field.

# **Institute of Medicine National Healthcare Quality Report Categories**

## **IOM CARE NEED**

Getting Better

## **IOM DOMAIN**

Effectiveness  
Safety

# **Data Collection for the Measure**

## **CASE FINDING**

Users of care only

## **DESCRIPTION OF CASE FINDING**

All surgical and medical discharges under age 18 defined by specific Diagnosis Related Groups (DRGs) (see the "Denominator Inclusions/Exclusions" field)

## **DENOMINATOR SAMPLING FRAME**

Patients associated with provider

## **DENOMINATOR INCLUSIONS/EXCLUSIONS**

### **Inclusions**

All surgical and medical discharges under age 18 defined by specific Diagnosis Related Groups (DRGs)

**Exclusions**

Exclude cases:

- neonates with birth weight less than 2500 grams
- with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 512.1 in the principal diagnosis field
- with an ICD-9-CM diagnosis code of chest trauma or pleural effusion
- with an ICD-9-CM procedure code of thoracic surgery, lung or pleural biopsy or diaphragmatic surgery repair or assigned to a cardiac surgery DRG
- normal newborn (DRG 391)
- Major Diagnostic Category (MDC) 14 (pregnancy, childbirth, and puerperium)

**Note:** Refer to the original measure documentation for specific DRG and ICD-9-CM codes.

**RELATIONSHIP OF DENOMINATOR TO NUMERATOR**

All cases in the denominator are equally eligible to appear in the numerator

**DENOMINATOR (INDEX) EVENT**

Clinical Condition  
Institutionalization  
Therapeutic Intervention

**DENOMINATOR TIME WINDOW**

Time window is a single point in time

**NUMERATOR INCLUSIONS/EXCLUSIONS****Inclusions**

Discharges among cases meeting the inclusion and exclusion rules for the denominator with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 512.1. in any secondary diagnosis field

**Exclusions**

Unspecified

**MEASURE RESULTS UNDER CONTROL OF HEALTH CARE PROFESSIONALS, ORGANIZATIONS AND/OR POLICYMAKERS**

The measure results are somewhat or substantially under the control of the health care professionals, organizations and/or policymakers to whom the measure applies.

**NUMERATOR TIME WINDOW**

Institutionalization

**DATA SOURCE**

Administrative data

## **LEVEL OF DETERMINATION OF QUALITY**

Not Individual Case

## **OUTCOME TYPE**

Adverse Outcome

## **PRE-EXISTING INSTRUMENT USED**

Unspecified

## **Computation of the Measure**

## **SCORING**

Rate

## **INTERPRETATION OF SCORE**

Better quality is associated with a lower score

## **ALLOWANCE FOR PATIENT FACTORS**

Analysis by high-risk subgroup (stratification on vulnerable populations)  
Analysis by subgroup (stratification on patient factors, geographic factors, etc.)  
Risk adjustment method widely or commercially available

## **DESCRIPTION OF ALLOWANCE FOR PATIENT FACTORS**

Risk adjustment of the data is recommended using, at minimum, birthweight, age in days, age and AHRQ Clinical Classification Software\*.

Application of multivariate signal extraction (MSX) to smooth risk adjusted rates is also recommended.

\***Note:** Information on the Clinical Classification Software (CCS) for ICD-9-CM is available at <http://hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp>.

## **STANDARD OF COMPARISON**

Internal time comparison

## **Evaluation of Measure Properties**

## **EXTENT OF MEASURE TESTING**

The development of the Agency for Healthcare Research and Quality (AHRQ) Pediatric Quality Indicators utilizes a four pronged approach: identification of candidate indicators, literature review, empirical analyses, and panel review. Candidate indicators were identified through both published literature and a brief survey of national organizations. Literature review provided descriptions and evaluations of some candidate indicators and the underlying relationship to quality of care. Empirical analyses were conducted to explore alternative definitions; to assess nationwide rates and hospital variation; and to develop appropriate methods to account for variation in risk. Clinical panel review helped to refine indicator definitions and risk groupings, and to establish face validity in light of the limited evidence from the literature for most pediatric indicators. Information from these sources was used to specify indicator definitions and make recommendations to AHRQ regarding the best indicators for inclusion in the pediatric indicator set.

A structured review of each indicator was undertaken to evaluate face validity (from a clinical perspective). This process mirrored that undertaken during the initial development of the Patient Safety Indicators. Specifically, the panel approach established *consensual validity*, which "extends face validity from one expert to a panel of experts who examine and rate the appropriateness of each item...." The methodology for the structured review was adapted from the RAND/UCLA Appropriateness Method and consisted of an initial independent assessment of each indicator by clinician panelists using an initial questionnaire, a conference call among all panelists, followed by a final independent assessment by clinician panelists using the same questionnaire. The panel process served to refine definitions of some indicators, add new measures, and dismiss indicators with major concerns from further consideration.

Empirical analyses were conducted to provide the clinical panels and peer review participants with additional information about the indicators. These analyses were also used by the development team to test the alternative specifications and the relative contribution of indicator components in the numerator and denominator. These analyses were not intended to inform issues of precision, bias and construct validity, which will be addressed separately. The data source used in the empirical analyses was the 2003 Kids' Inpatient Sample (KID).

Refer to the original measure documentation for additional details.

## **EVIDENCE FOR RELIABILITY/VALIDITY TESTING**

Fitch K, Bernstein SJ, Aguilar MD, et al. The RAND/UCLA appropriateness method user's manual. Santa Monica (CA): RAND; 2001. 109 p.

Green L, Lewis F. Measurement and evaluation in health education and health promotion. Mountain View (CA): Mayfield Publishing Company; 1998.

McDonald K, Romano P, Davies S, Haberland C, Geppert J, Ku A, Choudhry K. Measures of pediatric health care quality based on hospital administrative data: the pediatric quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Sep. 130 p. [82 references]

## Identifying Information

**ORIGINAL TITLE**

Iatrogenic pneumothorax in non-neonates (PDI 5).

**MEASURE COLLECTION**

[Agency for Healthcare Research and Quality \(AHRQ\) Quality Indicators](#)

**MEASURE SET NAME**

[Agency for Healthcare Research and Quality \(AHRQ\) Pediatric Quality Indicators](#)

**DEVELOPER**

Agency for Healthcare Research and Quality

**ENDORSER**

National Quality Forum

**ADAPTATION**

This measure was adapted from the AHRQ Patient Safety Quality Indicators.

**PARENT MEASURE**

Iatrogenic Pneumothorax, Provider Level (PSI 6) (Agency for Healthcare Research and Quality [AHRQ])

**RELEASE DATE**

2006 Feb

**REVISION DATE**

2008 Feb

**MEASURE STATUS**

This is the current release of the measure.

**SOURCE(S)**

AHRQ quality indicators. Pediatric quality indicators: technical specifications [version 3.2]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Feb 29. various p.

McDonald K, Romano P, Davies S, Haberland C, Geppert J, Ku A, Choudhry K. Measures of pediatric health care quality based on hospital administrative data: the pediatric quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 Sep. 130 p. [82 references]

## **MEASURE AVAILABILITY**

The individual measure, "Iatrogenic Pneumothorax in Non-neonates (PDI 5)," is published in "Measures of Pediatric Health Care Quality Based on Hospital Administrative Data: The Pediatric Quality Indicators" and "AHRQ Quality Indicators. Pediatric Quality Indicators: Technical Specifications [version 3.2]." These documents are available in Portable Document Format (PDF) from the [Pediatric Quality Indicators Download](#) page at the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators Web site.

For more information, please contact the QI Support Team at [support@qualityindicators.ahrq.gov](mailto:support@qualityindicators.ahrq.gov).

## **COMPANION DOCUMENTS**

The following are available:

- AHRQ quality indicators. Pediatric quality indicators: software documentation [version 3.2] - SAS. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar 10. 40 p. This document is available in Portable Document Format (PDF) from the [AHRQ Quality Indicators Web site](#).
- AHRQ quality indicators. Software documentation: Windows [version 3.1a]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Apr 6. 99 p. This document is available in PDF from the [AHRQ Quality Indicators Web site](#).
- Pediatric quality indicators (PedQI): covariates [version 3.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Mar 12. 52 p. This document is available in PDF from the [AHRQ Quality Indicators Web site](#).
- Pediatric quality indicators (PedQI): covariates (with POA) [version 3.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Mar 12. 52 p. This document is available in PDF from the [AHRQ Quality Indicators Web site](#).
- HCUPnet. [internet]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2004 [accessed 2007 May 21]. [Various pagings]. HCUPnet is available from the [AHRQ Web site](#). See the related [QualityTools](#) summary.

## **NQMC STATUS**

This NQMC summary was completed by ECRI Institute on December 28, 2007. The information was verified by the measure developer on March 31, 2008.

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